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STAFF APPRAISAL REPORT

KOREA

SEOUL URBAN TRANSPORTATION PROJECT

March 20, 1985

Urban and Water Supply Division
East Asia and Pacific Projects Department

CURRENCY EQUIVALENTS
(As of December 1, 1984)

Currency Unit	:	Won (W)
US$1	=	W 800

FISCAL YEAR

January 1 - December 31

WEIGHTS AND MEASURES

meter (m)	=	3.28 feet
kilometer (km)	=	0.62 miles
square meter (sq m)	=	10.8 square feet
pyong (py)	=	3.307 sq m or 35.586 sq ft
liter (l)	=	0.26 US gallons

ABBREVIATIONS AND ACRONYMS

CBD	=	Central Business District
ERR	=	Economic Rate of Return
GNP	=	Gross National Product
ICB	=	International Competitive Bidding
KAIST	=	Korea Advanced Institute for Science and Technology
MOC	=	Ministry of Construction
MOHA	=	Ministry of Home Affairs
MOT	=	Ministry of Transportation
SMG	=	Seoul Metropolitan Government
TPD	=	Traffic Police Department
TSM	=	Transportation System Management
UTIC	=	Urban Transport Improvement Committee

KOREA

SEOUL URBAN TRANSPORTATION PROJECT

Loan and Project Summary

Borrower:	Seoul Metropolitan Government (SMG)
Guarantor:	Republic of Korea
Amount:	$53.0 million equivalent
Terms:	Repayable in 15 years with three years of grace, at the standard variable interest rate. SMG would bear the foreign exchange risk.
Project Description:	The proposed project is expected to improve traffic and transport conditions in the Seoul metropolitan area. It includes the provision of missing road links on three major arterials together with road widening and reconstruction of major intersections, all within Seoul City. The project would also improve SMG's capability in transport planning and traffic engineering and management by introducing a program to maximize the utilization and improve the safety of existing roads and by supporting the related investment, organizational and staff training needs necessary for successful implementation.
Risks:	There are no special risks associated with the project. SMG is well experienced and capable of constructing the major civil works. However, the institutional development components can be expected to require more time to take hold. The project includes provision for consultants to assist SMG in these matters.

Project Costs:		Local	Foreign	Total
		($ million)		
	Civil Works	68.5	39.0	107.5
	Land acquisition	47.3	0.0	47.3
	TSM, Safety	9.8	8.9	18.6
	Institutional Development	0.6	0.6	1.2
	Base cost	126.1	48.5	174.6
II.				
	Physical contingencies	7.5	5.5	13.0
	Price contingencies	8.6	8.4	17.0
	Total project cost /a	142.2	62.4	204.6
Financing Plan:				
	IBRD	0.0	53.0	53.0
	SMG	142.2	9.4	151.6
	Total Financing	142.2	62.4	204.6

Estimated Disbursements:	Bank FY	1986	1987	1988	1989	1990
	Annual	6.90	12.30	18.40	10.80	4.60
	Cumulative	6.90	19.20	37.60	48.40	53.00

Rate of Return: 41%

Map: IBRD 18779

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a/ Including taxes and duties estimated at $6.1 million equivalent.

KOREA

SEOUL URBAN TRANSPORT PROJECT

STAFF APPRAISAL REPORT

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This report is based on the findings of an Appraisal Mission consisting of Messrs. L.M. Hannah, K.H. Willen, S.I. Kang (AEPUW) and R. Barrett (Consultant) who visited Korea between July 16 and August 4, 1984. Messrs. Hannah, Kang and Barrett visited Korea November 26 through December 7, 1984 for a follow-up mission. Ms. Elisabeth Hellman assisted in preparing the report.

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MAP

IBRD 18779

I. SECTORAL CONTEXT

Urbanization Trends

1.01 Two decades of rapid economic growth brought Korean per capita income to $2,000 by mid-1984. The high real rates of increase in the GNP (average 8.5% per annum (p.a.) since 1964) have been led by an expanding manufacturing sector, while agriculture has declined from over 40% of GNP in the early 1960s to less than 15% today. These high growth rates and the changing structure of the economy have resulted in a shift in much of the population out of rural areas. While the overall population growth has declined to under 1.5% p.a., the urban population continues to increase at more than 5% p.a. Today, over 60% of the 40 million Koreans live in urban areas, and this is projected to increase to 80% by the end of this century.

1.02 Korea is also a densely populated country with over 400 inhabitants per square kilometer. The combination of economic prosperity and rapid structural change in the economy in a physically crowded environment has created a significant number of very large cities. The metropolitan area of Seoul now includes approximately 14 million inhabitants, and there are three other cities over one million, and thirty-six over 100,000. This situation has led to a rapid rise in the demand for all types of urban services and the need to resolve heretofore non-existent problems associated with very large cities.

Urban Transport in Korea

1.03 The urban transportation system in Korea has functioned well but is approaching a critical phase in its development. The salient characteristic is the low but rapidly rising number of privately owned automobiles. At the end of 1982 there were 225,631 private automobiles in the country or 5.7 cars per thousand population (174 persons per car). This compares with 18 persons per car in Malaysia and 65 in the Ivory Coast, which both have income levels lower than Korea's.[1/]

1.04 The present low level of motorization is a result of high taxation on both the acquisition and the use of private cars during a period when Korean incomes were much lower than today and the stock of automobiles was small. However, based on recent trends, the future growth of the automobile population seems assured. Since the economy resumed growth in 1981, private automobile registration has been increasing at a rate of 20% p.a., which is fast enough to double the stock in four years. Although Government policy favors the development of a strong vehicle export industry which will be based, in part, on a solid domestic market, there are no signs that the financial disincentives to ownership and use will be significantly reduced. Nevertheless, rising incomes in a strong economy and the experience of other countries at Korea's income level suggest that a large increase in the number

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1/ Figures for Malaysia and the Ivory Coast are for 1981, cited in the Motor Vehicle Manufacturers Association, World Motor Vehicle Data 1983 Edition.

of autos seems plausible. This would certainly lead to a much greater demand for transportation infrastructure than presently exists. This expected increase in vehicle supply will be principally absorbed by the urban areas, and it is likely to quickly lead to extreme traffic congestion.

1.05 A serious aspect of the road transport sector in Korea is the poor accident record. In 1982, 6,110 persons were killed as a result of traffic accidents and over 130,600 persons injured, of which 45,200 were seriously injured or maimed. Pedestrians accounted for 63% of fatalities and 53% of injuries. Insurance claims amounted to $279 million equivalent. International comparisons based on 1978 data show that Korea had the third highest rate of deaths per 10,000 vehicles among 36 developing countries, with an accident rate roughly four to five times higher than in other Asian countries. It is doubtful whether the relative position of Korea has changed significantly since 1978 since little has been done to combat the problem on a systematic basis. It is estimated that road accident costs currently represent more than 1% of GNP per year.

Transportation in Seoul

1.06 Background. Almost one third of Koreans live in the greater Seoul area [2/] where 40% of the GNP and 60% of manufactured goods are produced. All types of activities and facilities are concentrated in Seoul, including over half (55%) of the vehicles in the country. Although the Government has tried to limit the growth of Seoul City through measures aimed at stimulating the development of secondary and satellite cities, the population has continued to increase at about 4% p.a. over the past decade in the city itself and twice as fast in the metropolitan region as a whole.

1.07 The populations of Seoul City and the greater Seoul area were estimated to be 8.7 million and 13.9 million respectively in 1982, making it one of the largest concentrations of urban population in the world. Seoul has been the capital of Korea since the fourteenth century, and the location of the Central Business District (CBD) and the street layout date back to that time. Until the early 1970s, development was concentrated on the north side of the Han River. The basic aim of the present master plan for the capital region is decentralization through the establishment and growth of satellite cities within a 40 km radius of the center of Seoul. Within Seoul City, the goals of the plan are to achieve equal population distribution both north and south of the river and to develop urban activity centers which will take some pressure off the CBD and, in transportation terms, reduce the concentration of trips to and from the CBD. Many construction projects in the past decade were on the south bank of the Han River where population density is high but employment still relatively low. The newly developed areas south of the river are well laid out with wide arterial roads connecting residential and commercial centers. A measure of the importance of the south bank development is the fact that the number of bridges across the river has more than doubled (to 14) since 1975.

2/ Includes Seoul and the surrounding cities which are part of a continuous urbanized area.

1.08 The urban transport system in Seoul city is composed of two main elements: the road network carrying public, private and commercial vehicles, and the subway/urban rail network. Compared with cities of the developed world, where more than 25% of the city area is typically devoted to transportation infrastructure, Seoul has a relatively small road area as a proportion of the total urban land, amounting to 10.4% in 1971, and 15.3% in 1981. The road area is planned to be increased to about 20% by the year 2000, and at the same time the proportion of paved roads is planned to be increased from 69% (1981) to 100% (2000). The emphasis of Seoul City's current road construction program is towards circumferential road projects and the improvement of cross-city links along the northern and southern banks of the Han River. Seoul is planning to construct approximately 36 km of arterials and expressways per year from now until the end of the century, involving an investment program of at least $60 to $80 million per year. The major focus of the short-term road program is to eliminate bottlenecks, build and improve major arterials of regional importance, and provide access to the eastern portion of the south bank where the stadiums for the 1988 Olympics and many apartment complexes are located.

1.09 Public transport plays a major role in Seoul's transportation system. Of the estimated 16.6 million daily trips by mechanical modes, about 67% are by bus, 15% by taxi, 7% by rail/subway, 9% by car and 2% by other modes such as bicycles. Compared to 1977, the shares of private cars and railways/subways have increased while those of buses, taxis and others have decreased. If walking is included, (journeys of more than 10 minutes), the total number of trips in 1982 was estimated to be 18.9 million per day with the following breakdown by mode: 59% by bus, 13% by taxi, 7% by rail/subway, 8% by car, 12% by foot and 1% by other modes.

1.10 In 1982, the vehicle fleet of Seoul City was made up of some 128,000 private cars, 30,000 taxis, 13,000 buses and 78,000 trucks and vans. The number of fixed-route buses was 8,055, with the remainder being operated as tour and company employee buses. The fixed-route buses comprised 6,810 city buses (20-25 seats with standing allowed) and 1,245 seat buses (25-37 seats with no standing). In addition to these two basic types of urban bus systems, a suburban bus system exists linking Seoul to communities in the surrounding region. On some sections of the central area road system, bus volumes attain 300-600 vehicles per hour, representing up to 50% of the total traffic measured in passenger car units (PCU).[3/] All bus services in Seoul are privately owned and operate without subsidy. Ninety private firms operate on 328 regular and seat bus routes throughout the city. A typical company owns 90 buses, each running between 350 and 400 km per day and each carrying some 1,380 passengers per day. These figures suggest an efficiently run system providing a good level of service. However, both the opening of the subway system (first phase in 1974 with full operation expected in 1985) and the growing private automobile traffic pose challenges for the bus system. Proper integration of the bus and subway systems is essential both to maximize utilization of the subway investment and to retain the viability of the bus

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3/ A PCU is a measure of road space taken by various types of vehicles.

system as it is adjusted to accommodate the subway lines. Although there are practically no public transport priority measures, such as bus lanes, in use at this time, they will become necessary to assure a continued high level of bus service in the face of greater road congestion in the future.

1.11 In addition to roads and surface rail, the other major infrastructure component of the Seoul transport system is the rapidly expanding subway network and the interlinked Korean National Railroad (KNR) passenger services. A first subway line of 9.5 km was opened in 1974; the second phase of 54.3 km in 1984, and the remaining two lines are expected to be complete by the end of 1985, when the entire system will include 123.0 kilometers and 102 stations. At the present time there is very little coordination among the subway system, the KNR system, and the bus route network. A major reorganization of the bus network is planned by Seoul Metropolitan Government (SMG) to maximize efficiency and provide feeder services to the principal subway stations.

1.12 Although the traffic situation is not yet serious compared to many other large LDC cities, Seoul's congestion is rapidly worsening. According to a recent study by Korean consultants, between one-half and three-quarters of the 112 critical intersections in Seoul will be saturated by 1988.[4/] The planned expansion of vehicle manufacturing for the home market, which could increase the number of cars in Seoul four to five times by 1996, will have a major detrimental impact on traffic speeds. The full consequences of this national level policy on the local transport system are not yet fully appreciated by Korean authorities.

1.13 The extensive subway system being constructed in Seoul cannot be expected to resolve the urban transport problems on its own, since most users must transfer from buses at both ends of their journey, and because subway ridership is projected to be mainly made up of existing bus users and not of automobile passengers. The resulting reduction in the number of buses will be small, because buses are presently overcrowded, and will offer only a very temporary improvement on the roads, since the current rate of growth of car traffic will overtake the released road space in a matter of two to three years. The signs of rising congestion are already apparent in Seoul where traffic volumes are growing by 10-15% p.a. The continuation of the present policies, which give emphasis to major road construction, will not be sufficient to resolve the traffic problems, because resources are too limited to accommodate unrestrained demand. Some officials now recognize that a comprehensive approach to demand management stressing cost efficiency, traffic management and bus priorities combined with strict controls on parking.

4/ Saturated means volume/capacity (V/C) ratios in excess of one which, if widespread, would signify massive traffic backups throughout the city and the extension of current peak hour conditions to two or even three hours. The projection assumes low and high growth rates for private vehicle traffic of 5% p.a. and 14% p.a., yielding 54% and 75% saturated intersections respectively.

1.14 Although congestion is most severe in the CBD and its approach roads, this is the most difficult part of the city in which to make improvements, since development is very dense, with associated high land costs and new right-of-ways almost impossible to find. Traffic in part of the central area of Seoul is controlled by a computerized signal control scheme, which in the next three years is to be extended from the present 131 intersections to 421, including major intersections south of the river. Although the control center is manned by the Traffic Police Department (TPD), few officers have any training in traffic control. The traffic accident situation in Seoul is serious, as in the country as a whole, with over 1,100 fatal accidents annually, a large proportion of which involve pedestrians, and some 36,000 recorded annual injury accidents.

Sector Organization

1.15 Cities in Korea are responsible for urban transportation planning, construction of transport infrastructure, traffic management and the provision and operation of their public transit systems. In Seoul, as is typical of the larger cities, a number of bureaus have responsibility for different aspects of the transportation system. The Office of Construction and Engineering constructs major civils works, the City Planning Bureau prepares the transportation master plan, the Construction Management Bureau programs road investments, the Transportation Bureau regulates public transport and places some road signs, and the Traffic Police Department is responsible for traffic control, enforcement and safety. Each Bureau does a good job within its well-defined responsibilities, but comprehensive planning or horizontal coordination of the whole urban transport system is weak. There are also a number of activities, such as traffic management, which have not been done in the past, both because they fall outside the mandate of the existing bureaus, and because the city has not traditionally recruited staff trained in these areas.

1.16 These fragmented responsibilities, along with a shortage of skilled technicians in the fields of transport planning, traffic engineering and project evaluation, have led to an urban transport system in Seoul City where planning is characterized by isolated treatment of individual problems. The existing road facilities are technically well constructed and efficiently implemented but are poorly integrated, and suffer from lack of continuity, poor connectivity and variable standards. In particular, very little attention, or budget, is devoted to improvements which are specifically designed to enhance the capacity of the existing road network except in the area of road maintenance, which is generally well carried out.

Government Priorities and Bank Lending Strategy

1.17 As part of the development strategy of the past twenty years the Government has deliberately directed resources toward industry and the promotion of export capacity in the economy. Investments in social infrastructure and services during this period did not match the spectacular growth of personal incomes. The rapid urban population growth, combined with under-investment in the past, has placed considerable strain on the quality of many urban services. In recent years, particularly starting with the Fifth Development Plan (1982-86), the Government began to give a higher priority to investments

in housing, water supply, environmental improvement and other urban services which enhance the quality of life. Planned investments in water supply increased more than six-fold in real terms between the Third (1972-76) and Fifth Plans; investment in housing reached an all time high of over 6% of GNP in 1983. In urban transport, major investments have been made in major arterial roads and for subway construction in Seoul and Busan, although insufficient attention has been given to the effectiveness of some of these investments. Bank support for urban development coincided with this new emphasis, with lending in the last five years shifting largely to support urbanization, industry and energy.

1.18 The Bank's objectives for urban sector lending to Korea, including urban transport are:

(a) to assist in effectively expanding urban infrastructure and providing services equitably;

(b) to introduce new technologies and innovative approaches to project planning and management;

(c) to strengthen the ability of sector institutions to plan and implement projects; and

(d) to promote a more comprehensive and long-term approach to policy formulation.

1.19 Since 1979, the Bank has made eight loans in support of urban development projects, two land development and low-income housing projects, three regional development projects, and three water supply projects. All have been designed to support significant policy and institutional changes. Implementation of all projects is proceeding satisfactorily with one project completed and two others substantially completed. The proposed project would follow the Bank's sector lending strategy. This approach allows for basic planning and evaluation techniques to be learned through their application on routine investments and for the process of institutionalizing systems which are new to Korea, such as Transportation System Management (TSM) to be methodically introduced and supported over a reasonable time period (see 2.03 below).

II. THE PROJECT

Project Origin and Formulation

2.01 The proposed project was first discussed with the Government in May 1980, when the Government raised the possibility of Bank financing of urban transport projects for several cities. A Bank mission visited Korea in October 1980 to review the urban transport situation generally and project possibilities specifically. The mission prepared an overview report for the Government, which, while noting significant progress made in recent years, highlighted the need for improvements in traffic and transport planning, traffic management, and urban transport policy formulation. The mission also

suggested the need for strengthening key institutions and for improved coordination among the various national and local government institutions. The mission identified specific projects for Seoul, Busan and three other cities. Regarding Seoul, the report observed that the transport situation was entering a critical stage because of the rapidly increasing automobile ownership, the need to integrate the subways with the surface systems, and the need to better connect the satellite cities to Seoul. Several project components were identified including traffic management, low-cost road improvements, construction of missing arterial and secondary road links, public transport planning and training. Based on the findings of the mission, transport planning studies were initiated in various cities (starting with Seoul in 1982 and Busan and other cities in 1983). Also in 1983, studies were initiated to consider a national training program and public transport operations. These studies have now been substantially completed and will provide the basis for a possible future project.

Project Rationale and Objectives

2.02 The objectives for this project include not only the construction of needed and justified urban transport infrastructure but also the promotion of more capable and better coordinated urban transport institutions. Korean agencies are now well experienced in general civil works, but are still weak in planning and coordinating a system of investments such as those necessary in the public transport field. Therefore, the rationale for the Bank to support urban transport projects in Korea is to promote institutional development in order to strengthen planning capability and to introduce traffic management concepts and practices.

2.03 This project has pursued these objectives, both during the preparation phase where interbureau coordination and the application of more rigorous evaluation techniques were required and in the project, by focusing on the introduction of a mechanism for planning and implementing improvements on the existing road and public transport network in Seoul through the practice of TSM. TSM is a comprehensive approach to traffic and transportation management, involving a wide variety of traffic control techniques and physical improvements ranging from minor road works to full scale reconstruction of major intersections. Institutional changes and reorganization are being undertaken in SMG specifically in response to the need to plan and implement the TSM program.

2.04 The objectives for the proposed project would be to:

(a) improve the transportation system in Seoul through a comprehensive set of investments and programs, including: (i) the introduction and application of TSM techniques along selected major transport corridors and in the CBD; (ii) improvements to major intersections; and (iii) the construction and widening of strategic road links;

(b) preserve and strengthen the public transport system by: (i) introducing bus priority measures; and (ii) promoting the integration of the bus and subway systems; and

(c) promote institutional development through strengthening the capabilities of SMG and TPD to plan, implement and evaluate traffic and safety improvements.

Project Description

2.05 The proposed project would include four principal components:

(a) major road investments;
(b) a program of major intersection improvements;
(c) TSM and Safety Programs; and
(d) institutional development measures.

Major Road Investments

2.06 The construction and widening of major arterial roads would be the largest project item involving approximately 70% of project costs. The proposed components are all high priority items in Seoul City's current transportation master plan. Three main routes are involved, as summarized below. (See IBRD Map 18779.)

(a) Eastern Arterial. The aim of this component is to upgrade and widen the eastern arterial road which forms an important regional link between Euijeongbu in the northeast and Seongnam in the southeast. This road acts as a major distributor of traffic in the eastern suburbs and an effective bypass to the central urban areas. Two sections of the road will be improved under the project. A 5.7 km section in the north will be widened from 4 lanes to 6 lanes, and a new 3.0 km six lane section will be constructed in the south. This latter section is an important missing link which will provide improved access to a Bank financed regional agricultural market in the area.5/

(b) Western Arterial. This component involves new construction of a missing link from Sihung to the Kyong-In Expressway, to form an effective western distributor and bypass to the central areas. The missing link, is a 10.8 km, four lane expressway including four major grade-separated interchanges.

(c) Gangbyeon Ro. (North Han Riverside Road). The objective of this component is to upgrade the existing North Han Riverside Road from two lanes to four lanes between Hannam Bridge and Jamsil Bridge. This 8.4 km link is built to inferior standards and is currently a bottleneck on this route. The Yeong Dong interchange, at the intersection of Gangbyeon Ro and the Eastern Arterial, would also be constructed under the project (see 2.07(a) below). Preliminary technical solutions and costs have been identified which were reviewed by the Bank and found to be acceptable. These are now

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5/ World Bank Loan No. 2111-KO.

being examined in detail through the ongoing detailed engineering study, the final results of which will be reviewed by the Bank in due course.

Major Intersection Improvements

2.07 Severe congestion is currently caused by a number of bottlenecks on the road network. Three such priority projects, currently in Seoul City's road program, are included in the project, representing about 16% of project costs. The feasibility and design studies for the Yeong Dong Interchange have been reviewed and found satisfactory by the Bank. The remaining two candidate intersections, which are scheduled for later implementation, will also be subject to detailed feasibility and design studies. The Bank's satisfactory review of the results of these studies is a condition of disbursement for investments under this category, other than the Yeong Dong Interchange. These three are (see IBRD Map 18779):

(a) Yeong Dong Interchange. The construction of a grade-separated interchange between the Eastern Arterial and the North Han Riverside Road (Gangbyeon Ro) will effectively reduce traffic congestion at the junction of two important corridors. The widening of the North Han Riverside Road together with TSM actions along the Eastern Arterial are also included as part of the project.

(b) Yeongdeungpo Rotary. The conversion of an existing rotary into a fully grade-separated interchange at the junction of Kyongin Ro and Gangnam Ro will accommodate rising volumes of both roads and rationalize the traffic flows through this congested location.

(c) Gilum Interchange. This intersection, at the junction of Mia Ro and the Second Ring Road, will be rebuilt as a fully grade-separated interchange to facilitate traffic movements westward onto the Ring Road.

Transportation System Management (TSM) and Safety Programs

2.08 The principal objective of this component is to introduce and carry out a system of low-cost traffic improvement measures along major corridors aimed at increasing road capacity, improving traffic flows with particular priority for public transport vehicles, and improving road safety. The Program involves the identification of traffic bottlenecks, traffic conflicts between different types of transport (buses, private cars, taxis, pedestrians), and accident blackspots along specific corridors. Typical measures utilized to deal with these problems include junction improvements, one-way streets, channelization, markings, signaling, bus bays and priority lanes, selective road widening, and pedestrian facilities such as safety islands and controlled crossings. For purposes of implementation, TSM improvements have been divided into "major" and "minor" categories. The distinction would be between those larger improvements implemented by the Office of Construction and Engineering and the smaller actions directly handled by the TSM Section. The cumulative effect of these measures is expected to lead to improved traffic flows and safety along the corridor as a whole. The project includes a

four-year program of TSM measures along about ten major traffic corridors and in the CBD. Preliminary plans for these corridors have been prepared which will be updated and detailed by the TSM Section (see para. 2.13 below) on an annual basis.

2.09 In addition to the safety measures included as part of the TSM Program, the project also includes a city-wide remedial program of accident prevention. This includes introduction of safety measures at about 200-300 hazardous locations, over four years, by carrying out investments recommended by the new accident investigation and analysis system to be introduced as a part of the institutional development of TPD (see para. 2.14 below).

2.10 In contrast with the major road investments which are discreet, the TSM and Safety components represent programs which should form a regular continuing activity within SMG. Thus, development of institutional arrangements for this purpose is an important part of the Programs. Although many existing units of SMG will be involved in the implementation of specific elements of the TSM Program, there is no single unit with the responsibility for developing such a comprehensive program or for monitoring the impact of the measures introduced as part of the preparation for this project. SMG has established and staffed a special TSM Section for this purpose within its Bureau of Transportation. The project includes staff training and expert advice to the TSM Section as a part of the institutional development program. The TSM and Safety Programs represent approximately 13% of project costs. Procedures and timetables for the TSM and Safety Programs can be found in Annex 1.

Institutional Development

2.11 This component supports technical assistance, training, studies and a limited amount of equipment to improve both the content and process of urban transport administration in Seoul City. It is focussed on the two main executing agencies - SMG and Seoul TPD - and represents about 1% of project costs. Although institutional changes are being undertaken specifically in response to the need to plan and implement the TSM and Safety Programs, the development of a TSM Section in SMG and an Accident Prevention Unit (within the TPD) would have a wider impact, since these agencies would serve as models for other local authorities to learn and assimilate new techniques for dealing with traffic and safety problems. The objectives for each portion of this component are described in the following paragraphs.

2.12 Transportation Bureau. The institutional development component to be implemented by SMG principally concerns the TSM Section within this Bureau. This component has three main objectives:

(a) to strengthen the newly formed TSM Section;

(b) to train staff in the use of TSM and road safety techniques; and

(c) to develop, within SMG, a coordinated and comprehensive approach to resolving urban transport problems.

2.13 These objectives would be achieved through the funding of:

(a) an Advisor to the TSM Section to assist in: (i) the preparation and implementation of traffic and safety improvement schemes for selected corridors and the CBD; and (ii) the establishment of a city-wide traffic monitoring program;

(b) consultants to carry out: (i) the detailed design and engineering of the traffic and safety improvement schemes; (ii) a traffic monitoring program to evaluate the impact of the TSM Program; and (iii) a demand management and comprehensive parking policy study; and

(c) the participation of SMG staff in local and overseas training programs. Terms of Reference for the Advisor and the consultants are given in Annex 1. These Terms of Reference together with a detailed training program and the content of the first year TSM Program were reviewed during negotiations. The existing and proposed new structure of the Transportation Planning Division are shown in Annex 2.

2.14 Traffic Police Department (TPD). The institutional development component to be implemented by the TPD will focus on accident prevention, road safety and traffic control. The objectives of this component, which are derived in large part from a Bank-financed road safety study (Loan 2228-KO), are: (a) to strengthen the Safety Unit of the TPD; (b) to train staff in the gathering and use of accident intelligence data and accident prevention techniques; (c) to prepare a citywide program of remedial actions at accident blackspot locations; and (d) to strengthen enforcement and traffic control practices. These activities would be undertaken in close collaboration with the newly formed TSM Section. The content, size and associated training for the TPD are described in Annex 1 and were agreed during negotiations.

Project Cost and Financing Plan

2.15 Project Cost. The total project cost, including price and physical contingencies, taxes and duties, is estimated at W 163,675 million ($204.6 million), of which W 49,948 million ($62.4 million) or about 31% represents the foreign exchange component. Property and land acquisition costs, estimated at about W 37,800 million ($47.3 million), are included. Taxes and duties are estimated at W 4,850 million ($6.1 million). The base cost is expressed in December 1984 prices. Cost estimates are based on detailed engineering designs for the 1985 construction program for roads and major interchange improvements, and preliminary engineering designs for the balance of the road construction program, except for the Yeongdeungpo and Gilum Interchanges, as well as TSM and safety works. Costs for detailed engineering and supervision (in addition to advisory services) are estimated at 4.0% of the cost of civil works; for TSM and road safety civil works the percentage is 5%. Consultant input is required at an estimated cost of $1.2 million. These costs are net of price contingencies but include salaries, fees, international travel and subsistence. Physical contingencies have been estimated at 20% for TSM and Safety Works, 15% for civil works with preliminary engineering, and 5% for those with detailed engineering, averaging about 7% of total base costs.

Price contingencies for foreign costs have been estimated at 8.0% in 1985, 9.0% p.a. thereafter. For local expenditures, price increases are estimated at 2.5% for 1985 and 5.5% thereafter. It is assumed that the real value of the won in dollar terms will remain constant over the life of the project.

Table 2.1: PROJECT COST SUMMARY

	Local	Foreign	Total	Local	Foreign	Total	Foreign
	(W mln)			(US$ mln)			%
1. Major roads	45,230	25,496	70,726	56.5	31.9	88.4	36
2. Major interchanges	9,563	5,691	15,254	12.0	7.1	19.1	37
3. TSM & safety works	7,812	7,105	14,916	9.8	8.9	18.6	48
4. Land acquisition	37,800	0	37,800	47.3	0.0	47.3	0
5. Technical assistance & training	470	470	940	0.6	0.6	1.2	50
Base cost (End 1984 prices)	100,875	38,762	139,637	126.1	48.5	174.5	28
Physical contingencies	5,973	4,436	10,409	7.5	5.5	13.0	43
Price contingencies	6,878	6,751	13,629	8.6	8.4	17.0	50
Total Project Cost	113,727	49,948	163,675	142.2	62.4	204.6	27

Note:
1. Total physical contingencies are about 7% of base cost; local and foreign price contingencies are about 10% of the base cost plus physical contingencies.
2. Taxes and duties are about W 4.85 billion (US$6.1 million).

2.16 Financing Plan. The proposed Bank loan of $53.0 million would contribute about 26% of total project costs. The loan would cover 85% of foreign exchange costs. The loan would be made to the Seoul Metropolitan Government for a term of 15 years including three years of grace. The Republic of Korea would guarantee the loan. The balance of the project costs, about Won 121 billion ($151.6 million), would be financed by SMG.

2.17 The proposed project would represent about 20% of expenditures for transportation during the implementation period (1985-88) or 3% of total expenditures by SMG. Some components are already part of SMG's investment program and the city should have no problem in providing the required funds. Assurances were obtained at negotiations that SMG would provide the necessary counterpart funds in a timely manner.

Table 2.2: PROJECT FINANCING PLAN
(US$ million)

	SMG	IBRD Loan	Total
Civil works	67.0	39.7	106.6
Land acquisition	47.3	0.0	47.3
TSM & Safety	11.2	8.2	19.5
Institutional Development	0.6	0.6	1.2
Base cost	126.1	48.5	174.6
Physical contingencies	11.0	2.0	13.0
Price contingencies	14.5	2.5	17.0
Total financing Required	151.6	53.0	204.6

III. PROJECT EXECUTION

The Borrower

3.01 SMG, the executing agency for the project, is an independent legal entity with the status of a "special city" under Korean law. The Mayor is appointed by the President of the Republic, reports directly to the Prime Minister and is an ex-officio member of the State Council. SMG employs 66,000 staff to serve its 8.7 million inhabitants.

3.02 The finances of SMG are substantially independent of the Central Government and the bulk of its revenues are generated locally. Government grants have accounted for only 3% of SMG's income in recent years and, if the size of the local tax revenue base increases as expected, the relative size of transfers from the government is likely to decline to negligible levels by the late eighties.

3.03 A summary of the past and projected future financial position of the "general account" of SMG is given in Annex 4. The Korean presentation does not distinguish between recurrent and capital expenditures. It can be seen, however, that total revenues for 1984 amounted to W 955 billion (US$1.2 billion) compared with total expenditures of W 806 billion (US$1.0 billion). In both 1983 and 1984, the overall surplus was significantly higher than in previous years, reflecting a general fiscal retrenchment at all levels of Government. It was agreed during negotiations that the audited financial statements of SMG (Statement of Settled Accounts) would be sent to the Bank within nine months of the end of each fiscal year.

3.04 It is a measure of the conservative fiscal management of SMG that expenditures have closely approximated revenues in recent years. Borrowing

has been small and related to the project requirements of individual departments rather than to any overall fiscal need. As of end-1984, SMG had an estimated W 71 billion equivalent of outstanding debt. Service payments, both principal and interest, amounted to only 2% of total revenues during 1984. Projections indicate that borrowing will continue to be marginal to SMG's revenue requirements and that total debt service will be no more than 2% of revenues by the end of the project-executing period.

Implementation Arrangements

3.05 The Project Management and Evaluation Bureau will have responsibility for overseeing the project with the following Bureaus directly involved in the implementation: Transportation, Construction Management, the Office of Construction and Engineering and the Traffic Police Department (a quasi-Bureau, dependent on SMG for budget for safety and traffic control investments). Other bureaus would be involved in the TSM component which will be coordinated by a committee, the Urban Transport Improvement Committee (see Annex 2 for membership and Annex 1, page 5 for UTIC role), which has been established to review and approve each year's TSM program.

3.06 Table 3.1 illustrates which Bureau within SMG would have responsibility for implementation for various project components.

Table 3.1: PROJECT RESPONSIBILITIES

Component	Feasibility	Design	Construction
A. Major roads & intersections	CM	CM	OC&E
B. TSM program			
Minor works	TSMS	TSMS	TSMS
Major works	TSMS	CM	OC&E
C. Safety Program	TSMS & TPSS	TSMS & TPSS	TSMS

Acronyms:

CM = Construction Management Bureau, Roads Division of SMG.
OC&E = Office of Construction and Engineering of SMG.
TSMS = Transportation System Management Section of the Transportation Planning Division of the Transportation Bureau of SMG.
TPSS = Traffic Police Safety Section.

3.07 The Office of Construction and Engineering is well experienced and capably staffed to carry out its role in the project. The newly created TSM

Section within the Bureau of Transportation has initially been staffed with six members drawn from existing SMG employees and would be supported by local and foreign advisors. The SMG's own plans call for upgrading the TSM Section to a full Division within about one year if the program proves to be successful. Assurances were obtained at negotiations that SMG would engage the TSM Advisor by June 30, 1985 and maintain this Section. Assurances were received that the TPD would engage advisors in the fields of safety and traffic control, by July 31, 1985, to introduce modern accident investigation and analysis procedures as well as to train TPD in the techniques of enforcement and safety improvement design.

Implementation Schedule

3.08 The project will be implemented over a four-year period, 1985-88, as shown in Annex 5. Detailed engineering has been completed for the Yeong Dong intersection and for major road works in the 1985 construction program. Related land acquisition has also been completed or is proceeding satisfactorily. The tendering process on the major first-year works has started; prequalification notice has been issued for ICB contracts, and the first set of bid documents are being prepared. The first set of contract awards is expected in June 1985. The southern end of the Western Arterial requires either that MOC construct a short connecting road outside the city boundary, or for SMG to upgrade an existing link road. MOC has already programmed this connecting road in its budget starting in 1985. Assurances were obtained from SMG that should MOC not go ahead with this construction, SMG will upgrade the existing link to adequate standards in time for the opening of the new section. SMG also gave assurances that a 0.9 km link between the northern end of the Eastern Arterial and the main Euijongbu Road, across Nowon Bridge, would be improved at approximately the same time as the widening of the Eastern Arterial is undertaken.

Procurement and Disbursements

3.09 Procurement arrangements for the project are summarized in the Table below:

Table 3.2: PROCUREMENT METHOD, COSTS AND BANK FINANCING /a
(US$million)

Project items	ICB	LCB	Other	Total cost
Civil works	126.0 (42.6)	23.9 (8.1)	-	149.9 (50.7)
Goods	0.6 (0.6)	-	0.3/b (0.3)	0.9 (0.9)
Land	-	-	47.3 (-)	47.3 (-)
Engineering, TA and training	-	-	6.5 (1.4)	6.5 (1.4)
Total	126.6 (43.2)	23.9 (8.1)	54.1 (1.7)	204.6 (53.0)

/a Figures in parenthesis are amounts financed by the Bank loan.
/b Procurement by prudent local shopping.

3.10 Civil Works. There would be about ten contracts for major works (roads and intersections) totalling about $126 million, and a large number of smaller contracts related to the TSM and Safety Programs (less than $1.0 million each) totalling about $24 million. All major contracts would be awarded on the basis of International Competitive Bidding (ICB) to prequalified contractors in accordance with World Bank Guidelines. The smaller civil works contracts, which are geographically scattered and to be implemented over a number of years, will be awarded on the basis of Local Competitive Bidding (LCB), in accordance with procedures which are acceptable to the Bank. Advance contracting would be allowed to enable SMG to adhere to its first-year construction program.

3.11 Goods contracts totalling about $0.6 million equivalent will be grouped in appropriate bidding packages and procured by ICB in accordance with Bank Guidelines. A preference margin of the lower of import taxes or 15% of the c.i.f. value, in accordance with Bank Guidelines, would be granted to domestic manufacturers in bid comparison. Miscellaneous goods costing less than $30,000 but totalling not more than $300,000 may be procured by prudent local shopping involving solicitation of at least three bids.

3.12 All civil works contracts over $1.0 million each, and goods contracts procured by ICB, will be subject to prior Bank review, which will cover about 85% of value of works and about 70% of goods value. Other contracts will be subject to selective post-award review. Consultants to be financed by the Bank loan would be selected according to the Bank's guidelines.

3.13 Disbursements of loan proceeds will be made against:

(a) 40% of civil works contracts, including major TSM and Safety component contracts;

(b) 100% of local expenditures (ex-factory cost) and 100% of foreign expenditures for materials and equipment; and

(c) 100% of total expenditures for technical assistance and training.

Disbursement for the following components will be made on the basis of statements of expenditure:

(a) civil works for TSM and Safety components contracts;

(b) for goods costing the equivalent of $30,000 or less each contract; and

(c) for technical assistance and training contracts.

All other disbursements would be fully documented. An estimated schedule of disbursements of the Bank loan is shown in Annex 5. It is expected that disbursements will be completed by June 30, 1990, about 18 months after completion of civil works, to allow for payment of contractors' retention monies. The proposed loan is expected to disburse in about five years, approximately the average time indicated by the disbursement profile for Korea. In order to facilitate project implementation, a special account of $4 million would be established, denominated in dollars. The Closing Date will be June 30, 1990.

Accounts and Audits

3.14 SMG will be responsible for maintaining detailed project accounts, giving a breakdown for land acquisition, civil works, equipment and services provided. SMG will also arrange for an annual audit by independent auditors acceptable to the Bank with audited project accounts submitted to the Bank within nine months of the close of each FY. Audits would contain a separate opinion on expenditures made against statements of expenditures that confirms to the Bank that claimed expenditures were used for the purposes for which they were provided. Assurances to the above effect were obtained at negotiations.

Progress Reporting and Monitoring

3.15 SMG (Project Evaluation and Management Bureau) will monitor project expenditures and the physical progress of the project and will prepare the Project Completion Report. This monitoring will include quarterly progress reports to be sent to the Bank within one month of the expiration of each quarter. The monitoring indicators for the major civil works would be based upon Annex 5 for physical progress and for financial matters on the year by year distribution of costs as shown in the detailed cost table (Annex 3). The TSM and Safety Program monitoring indicators are listed as the expected dates

of key events in Annex 1, pages 5 and 6. These arrangements were confirmed at negotiations.

IV. PROJECT JUSTIFICATION

Project Benefits

4.01 The proposed project would improve the transport and traffic conditions in Seoul City and its environs through improvements in road infrastructure and traffic management. The various investments included in the project are aimed at reducing traffic congestion, improving speeds and reducing travel times as well as improving road safety. Improvements in traffic are also expected to have a positive effect on the environment.

4.02 Besides physical improvements, the project will have significant institution building benefits. It will contribute to the strengthening of SMG's capacity in traffic and transport planning. The establishment and strengthening of the TSM Section and the Accident Prevention and Safety Unit will introduce, to Seoul, techniques in urban traffic management which have a high pay-off in economic terms.

Economic Evaluation

4.03 Although the principal purpose of the project is to build long-term institutional capacity in the urban transport sector, the major costs in the project are related to physical components to be implemented in the short run. The economic costs and benefits of these types of investments are subject to quantification, and the results of such analyses are presented in Table 4.1. In addition, there are likely to be significant benefits produced by the other components which can only be evaluated, a priori, in a qualitative manner.

4.04 The major road and intersection components together account for 86% of base costs. The expected benefits from these components would be to reduce congestion, which would be reflected both in increased travel speeds and greater capacity on the routes involved. Economic savings occur because vehicle operating costs (VOC) per km are lower at higher speeds (up to a limit which is rarely exceeded within cities), and because passengers save time in getting to their destination. The Economic Rate of Return (ERR) has been calculated for each of these major components and the results are shown in the following table with VOC savings indicated separately to illustrate their relative importance. As one would expect, time savings do play a major role particularly where bus traffic is so significant. Sensitivity analyses were carried out for the cases of benefits being reduced by 15% and costs growing by a similar amount as well as for both events occurring together. In all cases, the ERRs meet or exceed the accepted criteria for projects in Korea.

Table 4.1: SUMMARY OF ECONOMIC ANALYSIS
(Economic Rates of Return)

Component	(Share of costs %)	All benefits (time & VOC)	Sensitivity Analysis			
			VOC /a only	15% reduction in all benefits	15% increase in costs	Both
A. Nowon-Gongdae	(8)	18	4	15	16	15
B. Suseo-Segok	(5)	30	18	25	26	22
C. Kyong-In-Sihung	(28)	31	11	26	27	23
D. North Han River-Side Road	(30)	57	26	48	49	42
E. Yeong Dong Interchange	(7)	47	26	40	41	34
Weighted ERR	(78)/b	41/c	18	35	36	31

/a Vehicle Operation Cost Savings.
/b The Yeongdongpo and Gilum Interchanges (together 8% of project costs) will undergo economic evaluation as part of their feasibility studies. TSM & Safety Programs including Technical Assistance and Training account for 13% of project costs and equipment for the remaining 1%.
/c Weighted ERR. Includes components A, B, C, D and E, which account for 78% of total project costs.

4.05 The calculation of the effects of new construction and upgrading, such as proposed under this project, requires the operation of a traffic assignment model which is used to analyze the impact of various combinations of investments. The feasibility studies for the project conducted by KAIST[6/] included the field survey work and the design and operation of a large (200 zone) origin-destination and traffic assignment model. The investments proposed for inclusion in this project were subjected to analysis using the KAIST model. The basic assumptions and values utilized in this analysis are contained in Annex 7.

4.06 The methodology described in the preceding paragraph only applies once a particular investment has been proposed. To select subproject candidates several steps were required. First, each candidate was examined for consistency with Seoul's Master Land Use and Transportation Plan. This exercise included analysis of the likely impact of ongoing transportation investments such as the subway system. Existing congestion levels served as the second screening criteria. Since urban transport investments are not mutually exclusive projects, a series of actions along a corridor are proposed as a network of investments. Finally, each route or project identified by this

6/ Korea Advanced Institute of Science and Technology.

process was compared with technically feasible alternatives to confirm that a least-cost solution was being pursued.

4.07 The TSM and Safety Programs, which constitute about 13% of project costs, were not subject to comparable economic analysis because of the difficulty in calculating the cumulative effect of many individual measures which form a part of the total TSM package, and because of the difficulty in quantifying benefits such as accident reduction. However, the experience of other countries is that the returns on TSM type actions are very high because significant improvements are possible with relatively small additions to existing facilities. They typically augment capacity by 10% to 20% at almost negligible cost compared to new construction. Given the prevalence of bottlenecks and road system discontinuities identified in the feasibility study for this project, it is anticipated that the benefits will be at least as high as in other countries. For Seoul it is estimated that TSM actions will cost between $200,000 and $500,000 per kilometer. If they result in increased speeds of only 10%, ERRs from 30% to more than 70% should be achieved. The present poor safety record with its high costs for Korea also means that the returns to the program should be good. In the case of TSM, a continuous monitoring program, which will evaluate the impact of the schemes, will also provide an opportunity to calculate ex post economic rates of return for each year's program.

Impact on the Urban Poor

4.08 It is difficult to estimate the precise impact of the project on the poverty group since project benefits would accrue to the population at large rather than to any particular income group. According to World Bank guidelines, the relative urban poverty line in Korea is $625 (in 1984) per capita annually which places about 16% of the population below this threshold. The benefits of this project are expected to go at least proportionately to lower income groups because the investments are focused on heavily travelled routes where bus and taxi traffic are higher than average and because public transport priority measures will be introduced for the first time. Thus, at least 16% of the project cost is estimated to benefit persons from the poverty group.

Project Risks

4.09 SMG, the implementing agency for the civil works, is competent and well experienced, and there are no special risks associated with implementation of major civil works components. The implementation of the TSM and Safety components, particularly the first-year program, will require technical support from advisors with international experience. Adequate technical assistance is provided for in the project to assist the TSM Section and TPD. The institutional development measures will require more time and effort to become a permanent part of each organization. For this reason the project preparation has included extensive and detailed discussions on the institutional aspects of the project which culminated in agreements to strengthen key SMG Bureaus involved in the project. The actions already taken by SMG in this respect give a good indication of the commitment of SMG to diligently pursue implementation.

V. AGREEMENTS REACHED AND RECOMMENDATION

5.01 Agreements were reached with SMG during loan negotiations:

(a) that the Bank's review of satisfactory feasibility and engineering studies would be a condition of disbursement on Yeongdeungpo Rotary and Gilum Interchange (para 2.07);

(b) that SMG would provide the necessary counterpart funds in a timely manner (para. 2.17);

(c) that the TSM Section would engage the Traffic Engineering Advisor by June 30, 1985, and that SMG would maintain this Section (para. 3.03);

(d) that the TPD would appoint Safety and Traffic Control Advisors by July 31, 1985 (para. 3.03);

(e) that the link road from the southern end of the Western Arterial to the main road would be improved to adequate standards if the section of the Western Arterial outside the city boundary is not constructed by MOC in time for completion of the new Sihung to Kyong-In section, (para. 3.04);

(f) that the link between the northern end of the Eastern Arterial and the main Euijongbu Road, across Nowon Bridge, would be improved at approximately the same time as the widening of the Eastern Arterial is undertaken (para. 3.04);

(g) that a Special Account in the amount of $4 million be established at the Korea Exchange Bank (para. 3.09);

(h) that a separate project account be established which would be audited annually (para. 3.10); and

(i) that the Project Evaluation and Management Bureau monitor project progress and prepare the Project Completion Report (para. 3.11).

5.02 The following matters were reviewed with SMG during negotiations and understandings were reached:

(a) on the content and specific timetable for the first years TSM Program, the Terms of Reference of the Advisor to the TSM Section, details of the training program and Terms of Reference for TSM monitoring and a study to establish a demand management comprehensive parking policy, (para. 2.13);

(b) on the content, size, associated training and the Terms of Reference for advisors to the road safety program (para. 2.14);

5.03 With the above assurances, the proposed project would be suitable for a Bank loan of $53 million. The loan would be for a period of 15 years including three years of grace at the standard variable interest rate. The Borrower would be Seoul Metropolitan Government with a guarantee agreement with the Republic of Korea.

Summary of Draft of Terms of Reference for a Traffic Engineering Advisor to the SMG Bureau of Transportation (TSM Section)

Introduction

The Seoul Metropolitan Government (SMG) has recently created a new Section in the Bureau of Transportation to undertake a citywide program of comprehensive traffic and safety improvements. The new Transportation System Management (TSM) Section will be responsible for the planning, design and implementation of the traffic and safety improvement projects. The projects will be jointly funded by SMG and IBRD as part of the Seoul Urban Transportation Project. The services of a long term Advisor are being sought to assist SMG with the TSM and Safety components of the project.

Objectives

The objectives of the present Terms of Reference are: (a) to set out the qualifications and experience required of the Advisor; and (b) to outline his duties.

Qualifications

The Advisor should have a minimum of 5 years experience working on traffic improvement projects in a major city. His experience should include the design of traffic control, bus priority and pedestrian improvement schemes. The Advisor should preferably have an engineering background.

Duties.

The principal duties of the Advisor will be to assist the SMG Bureau of Transportation (TSM Section) to:

(a) carry out the preliminary planning and feasibility studies for comprehensive traffic, bus priority and pedestrian improvement schemes along selected transport corridors and in the Central Business District (CBD);

(b) draw up and supervise the implementation of a program of data collection to provide information for detailed design and monitoring of the proposed traffic improvements, including volumes, speeds (car and bus), ridership, accidents etc;

(c) prepare Terms of Reference for the detailed design of comprehensive traffic improvement projects for the selected corridors and the CBD and review the consultant's work;

(d) implement the TSM and Safety Programs; and

(e) prepare Terms of Reference for and to assist SMG in the implementation of a study which will lead to a demand management and comprehensive parking policy for the Seoul CBD.

Duration: 36 months (may be contracted for one year at a time).

Draft Terms of Reference for the Feasibility and Detailed Design of TSM Improvement Schemes

Introduction

The Seoul Metropolitan Government (SMG) wishes to hire consultants to carry out feasibility studies and detailed study and design of a comprehensive traffic improvement scheme for the ..... (Corridor or Central Business District (CBD)). Detailed design of some major projects identified during feasibility may be contracted separately. This project forms part of a program of transportation system management (TSM) improvements being initiated by the TSM Section of the Bureau of Transportation Planning. The program is being jointly financed by SMG and IBRD.

Objectives

The objectives of the present Terms of Reference are: (a) to set out the aims of the proposed study; (b) to described the scope of work; and (c) to detail the outputs required.

Project Aims

The principal aim of the proposed study is to prepare a comprehensive traffic and safety improvement plan for the whole of ..... (Corridor or CBD) which: (a) enhances the capacity of the existing route by removing bottlenecks; (b) facilitates the smooth flow of public transport vehicles by providing bus priority measures; (c) promotes the integration of bus, taxi and subway systems; (d) improves travel and safety conditions for pedestrians; and (e) reduces the accident rate at high risk sites by the use of accident blackspot remedial measures. The solutions adopted to achieve this aim should make full use of low-cost traffic management and TSM techniques but should also include higher cost infrastructure solutions if appropriate.

Project Scope

The consultants will be responsible for the carrying out the following tasks:

(a) the collection of all pertinent data required to carry out feasibility studies of all components and detailed design of low cost measures. The detailed design of higher cost capital intensive components will be the subject of a separate contract. Data collection should include as a minimum:

(i) turning movement counts at all key intersections;

(ii) classified counts along the corridor at approximately one kilometer intervals (or at specified locations in the CBD) and at high accident risk sites;

(iii) travel speeds and delays of private and public transport vehicles

along the whole corridor (or along specified roads in the CBD). At least six runs at each timing period will be required to obtain statistically significant results;

(iv) accident analyses and diagrams for the whole corridor and approach roads for a two to three year period; and

(v) pedestrian counts where pedestrian flows are heavy and conflict with traffic movements, and where significant numbers of accidents occur;

(b) feasibility studies involving the analysis of alternative design concepts at bottleneck locations and high accident risk sites together with justification (economic rate of return, reserve capacity etc.) of the solutions recommended. Forecasts of future traffic volumes should be used to test the recommended solutions. Functional plans should be prepared for low cost schemes along the whole corridor and each major improvement; and

(c) detailed plans of specific improvements and plans for the whole corridor showing road markings, regulatory and direction signs, traffic signal installations and other traffic control facilities, bus and taxi stops and terminals; pedestrian facilities; street lighting and any other proposed improvements. Detailed engineering design of high capital cost structures will be the subject of separate contracts.

Required Outputs

The results of the feasibility study and detailed design should be presented in the form of a report together with annexes and detailed plans. The report should contain all relevant data and information required to support the design recommendations. In addition, the report should contain detailed explanations of the proposals for:

(a) public transport priority improvements and public transport facilities;

(b) phasing diagrams and linking schedules together with supporting calculations for all traffic signal installations;

(c) detailed proposals for traffic regulations with regard to the parking and loading and unloading of vehicles;

(d) detailed cost estimates;

(e) economic justification and calculations of reserve capacity giving the assumptions made about future traffic growth; and

(f) calculations of accident rates at blackspot locations.

The annexes should contain details of all the data collection excercises indicating how and where the data was collected and the results. The type of data and survey methodology should be sufficiently detailed so as to permit similar 'after' surveys to be undertaken to monitor the impact of the improvement schemes.

Plans should be prepared in sufficient detail for contracting purposes. All documents should be prepared in Korean and English.

SEOUL URBAN TRANSPORTATION PROJECT
PROCEDURES AND TIMETABLE FOR TSM PROGRAM

EXPECTED TIMING	TSM PROGRAM
By negotiations	1. TSM Section - established - staffed - Section head appointed - study tour undertaken - Terms of Reference for Traffic Engineering Advisor; monitoring and parking studies established - agreement of UTIC to scope of first year TSM program - first year feasibility studies underway.
Agree at negotiations	2. Overall scope and size of TSM Program for the life of the project and all Terms of Reference.
June 1985 (IBRD review)	3. Feasibility studies for first year program complete. Review by UTIC.
	4. Appointment of Advisor.
"	5. Contracts for detailed design of major TSM works commence.
July 1985 (IBRD review)	6. Detailed design of minor works complete.
September 1985	7. Implementation of first year's program begins.
	8. Feasibility studies for second year's program begins.
December 1985 (IBRD review)	9. Detailed design of major works complete.
January 1986	10. Implementation of major TSM civil works begins

STEPS 3 TO 10 (EXCEPT 4) TO BE REPEATED ON AN ANNUAL BASIS

SEOUL URBAN TRANSPORTATION PROJECT
PROCEDURES AND TIMETABLE FOR SAFETY PROGRAM

EXPECTED TIMING	SAFETY PROGRAM
By negotiations	1. Preparation of Terms of Reference for Safety Advisor.
Agree at negotiations	2. Terms of Reference for Safety and Enforcement Advisors, training program and overall work program.
June 1985	3. Short listing of candidate Safety Advisors.
July 1985	4. Appointment of Safety Advisor.
August 1985	5. Completion of review of safety aspects into first year TSM Program.
December 1985 (IBRD review)	6. Completion of detailed design of first-year Safety Program of remedial actions at accident blackspots.
April 1986	7. Implementation of first year's Program begins.
June 1986	8. Short listing of Candidate Enforcement Advisors. Completion of training materials for local training program.

STEPS 5 TO 7 TO BE REPEATED ON ANNUAL BASIS.

DRAFT OUTLINE OF TERMS OF REFERENCE FOR TRAFFIC POLICE ADVISORS

Introduction

The Seoul Metropolitan Government (SMG) in collaboration with the Traffic Police Department (TPD) proposes to carry out a major program of traffic and safety improvements in Seoul City as part of a comprehensive approach to resolving urban transport problems. Part of this program involves the strengthening and training of the TPD in the fields of traffic safety and traffic signal control and enforcement. The present Terms of Reference provide a broad outline of the duties of the two Advisors who would assist the TPD.

The duration of the inputs of the Advisors would be as follows: Traffic Safety Advisor - 12 months; and Traffic Control and Enforcement Advisor - 12 months.

Qualifications

Both Advisors should have a minimum of five years of experience in their topic area, some of which should include experience of modern techniques as practiced in Europe and North America.

Duties

Traffic Safety Advisor. The principal duties of the Traffic Safety Advisor will be to assist the TPD:

(a) to develop accident investigation techniques, selective enforcement measures and assist in the formation of an Accident Prevention Unit;

(b) to prepare an accident blackspot alleviation program at 250 - 300 locations throughout Seoul City to be implemented over the period 1985 - 1988;

(c) to review the traffic improvement measures being prepared by SMG's TSM Section;

(d) to establish a city-wide traffic accident monitoring program making full use of the latest computer analysis techniques;

(e) to advise on the purchase of equipment for the Accident Prevention Unit; and

(f) to develop training curricula and materials which can be used in the development of local training programs.

Traffic Control and Enforcement Advisor. The principal duties of this Advisor will be to assist the TPD:

(a) to improve the performance of the existing computerized area traffic control schemes and individual intersections;

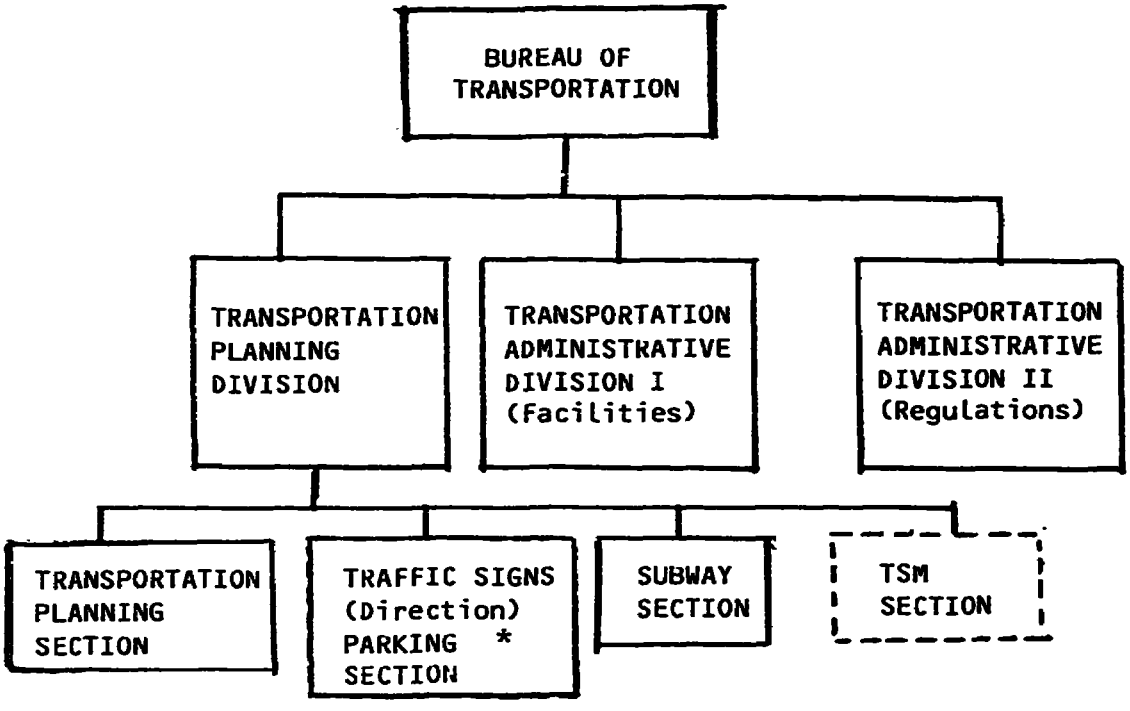
(b) to train staff in the improved traffic signal operations techniques;

(c) to improve traffic enforcement methods in general and in respect to modern traffic management techniques including bus priority measures, one-way streets, reversible lanes, etc.; and

(d) to improve traffic signing and road marking standards.

ANNEX 2
Page 1

Existing and Proposed Structure of SMG's Transportation Bureau



——— present

– – – – new for project

* combines two existing divisions

MEMBERSHIP ON THE URBAN TRANSPORT IMPROVEMENT COMMITTEE (UTIC)

Chairman	Vice Mayor
Vice Chairman	Director General, Bureau of Transportation
Secretary	Director of Transportation Planning Division
Members	5 SMG Officials Director Generals of: City Policy Investment Management Urban Planning Construction Management Construction Engineering Representatives from: Traffic Police MOT Prime Minister's Office 5 Representatives from Transport and Safety Associations 10 Outside Experts

ANNEX 3: DETAILED PROJECT COST

PROJECT COMPONENTS	MILLION WON				MILLION U.S.$				MILLION WON					
	LOCAL	FOREIGN	TOTAL	BASE COST(%)	LOCAL	FOREIGN	TOTAL	FOREIGN(%)	1984	1985	1986	1987	1988	TOTAL
1.MAJOR ROADS	38244	25496	63740	46	47.81	31.87	79.68	40	0	10198	21672	27408	4462	63740
Eastern Arterial	6240	4160	10400	7	7.80	5.20	13.00	40	0	4264	2600	3536	0	10400
Suseo Dong - Segok Dong	2580	1720	4300	3	3.23	2.15	5.38	40	0	3440	860	0	0	4300
Nowon Br. - Gongdae Chon	3660	2440	6100	4	4.58	3.05	7.63	40	0	0	2440	3660	0	6100
Western Arterial	15504	10336	25840	19	19.38	12.92	32.30	40	0	5943	13437	6460	0	25840
Kyongin X-way - Sihung	15504	10336	25840	19	19.38	12.92	32.30	40	0	5943	13437	6460	0	25840
North Han River Road	16500	11000	27500	20	20.63	13.75	34.38	40	0	0	6325	19250	1925	27500
2.DESIGN AND SUPERVISION	2550	0	2550	2	3.19	0.00	3.19	0	0	459	790	1071	229	2550
3.MAJOR INTERCHANGES	8537	5691	14228	10	10.67	7.11	17.79	40	0	2304	3136	8788	0	14228
Yeongdong	2304	1536	3840	3	2.88	1.92	4.80	40	0	2304	1536	0	0	3840
Yeongdeungpo	4800	3200	8000	6	6.00	4.00	10.00	40	0	0	1600	6400	0	8000
Gilum	1433	955	2388	2	1.79	1.19	2.99	40	0	0	0	2388	0	2388
4.DESIGN AND SUPERVISION	640	0	640	0	0.80	0.00	0.80	0	0	128	192	320	0	640
5. TSM AND SAFETY WORKS	6805	6805	13609	10	8.51	8.51	17.01	50	0	272	4899	5444	2994	13609
TSM (CORIDOR & CBD)	5725	5725	11450	8	7.16	7.16	14.31	50	0	229	4351	4580	2290	11450
SAFETY	1080	1080	2159	2	1.35	1.35	2.70	50	0	0	432	756	972	2159
6.DESIGN AND SUPERVISION	680	0	680	0	0.85	0.00	0.85	0	0	327	88	265	0	680
7. TAXES AND DUTIES CIVIL WORKS	4823	0	4823	3	6.03	0.00	6.03	0	0	723	1736	1640	723	4823
8. EQUIPMENT	300	300	600	0	0.38	0.38	0.75	50	0	300	300	0	0	600
9. TAXES AND DUTIES EQUIPMENT	27	0	27	0	0.03	0.00	0.03	0	0	14	14	0	0	27
10. LAND ACQUISITION	37800	0	37800	27	47.25	0.00	47.25	0	9828	4158	9828	13986	0	37800
11. TECHNICAL ASSIST AND TRAINING	470	470	940	1	0.59	0.59	1.18	50	0	301	301	301	38	940
BASE COST	100875	38762	139637	100	126.09	48.45	174.55	28	9828	19184	42956	59223	8446	139637
PHYSICAL CONTINGENCIES	5973	4436	10409	7	7.47	5.54	13.01	43	0	1770	3539	4372	729	10409
PRICE CONTINGENCIES	6878	6751	13629	10	8.60	8.44	17.04	50	0	512	3289	7733	2095	13629
TOTAL PROJECT COST	113727	49948	163675	117	142.16	62.44	204.59	31	9828	21465	49784	71328	11270	163675

ANNEX 4

ANNEX 4 : SMG INCOME AND EXPENDITURE 1981 - 1988
(MILLION WON)

	1981 ACT	1982 ACT	1983 ACT	1984 PRL	1985 EST	1986 EST	1987 EST	1988 EST
REVENUE:	492164	661100	857271	954671	1140300	1366445	1639171	1963605
LOCAL TAX	354295	458391	592412	635348	782749	964346	1188075	1463708
NON TAX & FEES	101812	154547	224643	279648	313206	350790	392885	440032
TRANSFER FR GOVERNMENT	24342	27922	20845	19643	20625	21656	22739	23876
BORROWING	11715	20240	19371	20032	23720	29652	35472	35989
EXPENDITURE:	485128	584589	722206	806379	991211	1219120	1500427	1847024
GENERAL	473257	572002	706797	788942	971977	1197475	1475289	1817556
DEBT SERVICE	11871	12587	15409	17437	19234	21645	25138	29468
NET INCOME BEFORE BORROWING	-4679	56271	115694	128260	125369	117673	103272	80591

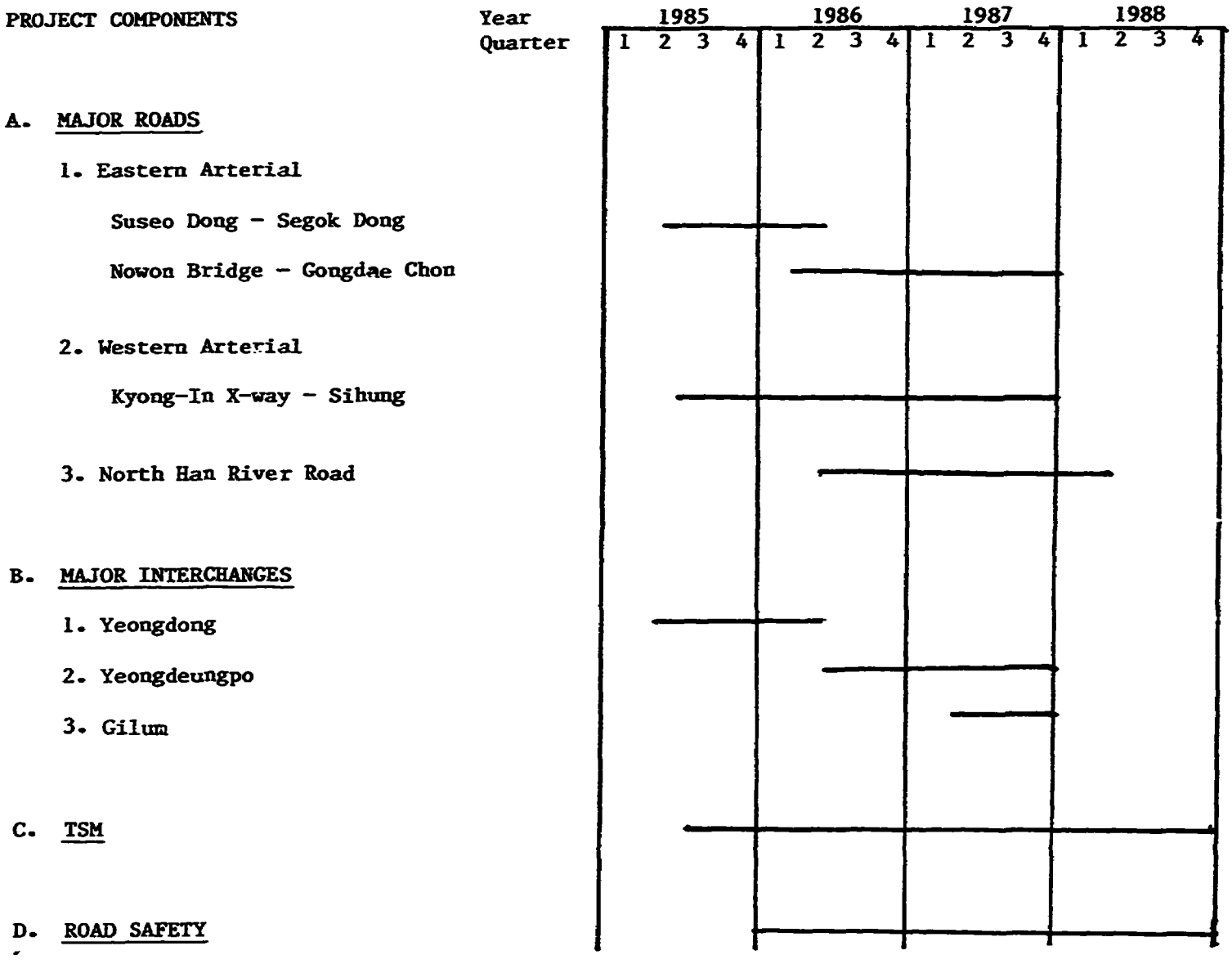
SOURCE : SMG (ACTUALS AND PRELIMINARY)
MISSION PROJECTIONS (ESTIMATES)

ANNEX 5

KOREA

SEOUL URBAN TRANSPORTATION PROJECT

IMPLEMENTATION SCHEDULE



ANNEX 6

KOREA

SEOUL URBAN TRANSPORTATION PROJECT

DISBURSEMENT SCHEDULE
(US$ Million)

Bank's fiscal year	Year and semester ending	Disburse-ment	Cumulative disbursement	Disbursement Profile Korea	Project
1986	12/31/1985	3.1	3.1	5.2%	5.8%
	06/30/1986	3.8	6.9	13.6%	13.0%
1987	12/31/1986	5.4	12.3	25.7%	23.2%
	06/30/1987	6.9	19.2	40.2%	36.2%
1988	12/31/1987	8.5	27.7	54.6%	52.2%
	06/30/1988	9.9	37.6	68.1%	71.0%
1989	12/31/1988	6.2	43.8	78.9%	82.6%
	06/30/1989	4.6	48.4	87.1%	91.3%
1990	12/31/1989	3.10	51.5	94.0%	97.1%
	06/30/1990	1.50	53.0	100.0%	100.0%

Closing Date: June 30, 1990.

KOREA

SEOUL URBAN TRANSPORTATION PROJECT

Economic Analysis: Basic Assumptions and Data

1. Value of Time. An important type of benefit derived from traffic improvement schemes is the time saved by travellers. For the analysis of this project, the value of time saved has been adjusted for various types of vehicles and for work versus non-work related trips to reflect the different income levels of those using different travel modes, and the fact that the opportunity cost of work hours is much greater than that of time spent travelling to work for most people. Table 1 shows the value of time (won per minute) for the occupants of the four vehicle types on Seoul's roads as well as the typical minimum wage being paid. Work trips are assumed to make up 5% of traffic and are valued at 110% of the numbers in Table 1 to reflect the overhead involved in this activity. All other trips are assessed at one third of the time values shown below.

Table 1: TIME VALUE OF OCCUPANTS
(won/minute)

Auto	Taxi	Truck	Bus	Minimum Wage
24	20	12	6	15

Source: SMG Economic Evaluation for each of the seven components.

2. Vehicle Operating Costs (VOC). VOC are the principal ingredients in benefit calculations. VOC are based on the fact that vehicle operating costs decline as average speeds increase. VOC include fuel, oil, tire and maintenance costs net of taxes. The following chart illustrates the relationship between the various type of vehicles and costs per kilometer.

3. The Cost Vehicle Delay has been calculated using the VOC value for a low speed (8 km/hr) and adding the weighted time value per vehicle type for time savings estimation. The result is Won 1900/hr for a passenger car, Won 6000/hr for a bus, and Won 2300/hr for a truck.

4. For the purposes of economic evaluation, the cost of project components has been calculated in the following manner. Costs of construction were taken at base year prices (mid-1984) increased by the estimate of physical contingencies but net of taxes. The benefit stream, also estimated in 1984 prices, starts in year two and continues through year 20 in constant prices, the assumed life of the major capital improvements. Maintenance is based upon actual expenditures for similar types of projects and has been subtracted from the benefit value for each year.

Chart 1: VEHICLE OPERATING COSTS (VOC)
(Won per Kilometer - Without tax)

Speed	Passenger Car					Bus					Truck				
	Fuel	Oil	Tire	Maint	Total	Fuel	Oil	Tire	Maint	Total	Fuel	Oil	Tire	Maint	Total
8	111.77	1.05	.22	6.03	119.07	275.08	4.35	0.26	15.93	295.62	275.08	4.36	0.32	12.06	291
24	44.16	0.91	.40	6.37	51.84	95.30	2.26	0.85	16.20	114.61	95.95	2.26	1.06	12.24	111
40	34.35	0.80	.92	7.01	43.08	62.81	1.88	1.51	17.93	84.13	62.81	1.84	1.89	13.58	80
56	30.10	.74	1.14	7.82	39.80	51.98	1.68	2.32	20.79	76.77	52.20	1.61	2.91	15.78	72
72	31.40	.71	1.27	8.72	42.10	48.08	1.43	3.34	24.42	77.27	50.47	1.26	4.18	18.52	74
88	34.02	.76	1.32	9.69	45.79	50.90	1.41	4.71	28.48	85.50	54.15	1.16	5.90	21.57	82

Source: KAIST Technical Report Volume 1, p. 69.

COST AND BENEFIT DATA
(million Won)

Component	Economic cost /a	Benefits VOC/yr	Benefits Time/yr	Benefits Total/yr
A. Nowon-Gongdae	11,944	879	1,410	2,289
B. Suseo-Segok	7,613	1,412	898	2,310
C. Kyong-In-Sihung	40,369	5,217	7,379	12,596
D. North Han River Road	42,784	11,100	13,100	24,200
E. Yeongdong Interchange	10,569	2,833	2,102	4,935

/a Includes construction, maintenance, land acquisition and physical contingencies, excludes taxes and duties.

ANNEX 8

KOREA

SEOUL URBAN TRANSPORTATION PROJECT

Docouments Available in the Project File

Studies and Other Documents

(a) Seoul Metropolitan Government. Economic Evaluation for each of the seven components, July1984.

(b) Seoul Metropolitan Government and Sam Woo Consulting Engineering Co., Ltd. Detail Design for New Alignment Construction between SEGOK - SUSEO LINK (main report and one annex), May 1984.

(c) Seoul Metropolitan Government. Design of New Alignment and Interchange Project of Yeongdong Bridge, 1984.

(d) Dong Il Consulting Engineering Co., Ltd., New Alignment and Widening Project of Dongil-Ro. Geometric and Structural Drawings, 1984.

(e) Seoul Metropolitan Government and Korea Engineering Consultants Corporation. New Alignment Project of Western Arterial Road.

(f) Seoul Metropolitan Government. Statistical Yearbook, 1983.

(g) Ministry of Transportation. Statistical Yearbook of Transportation, 1983.

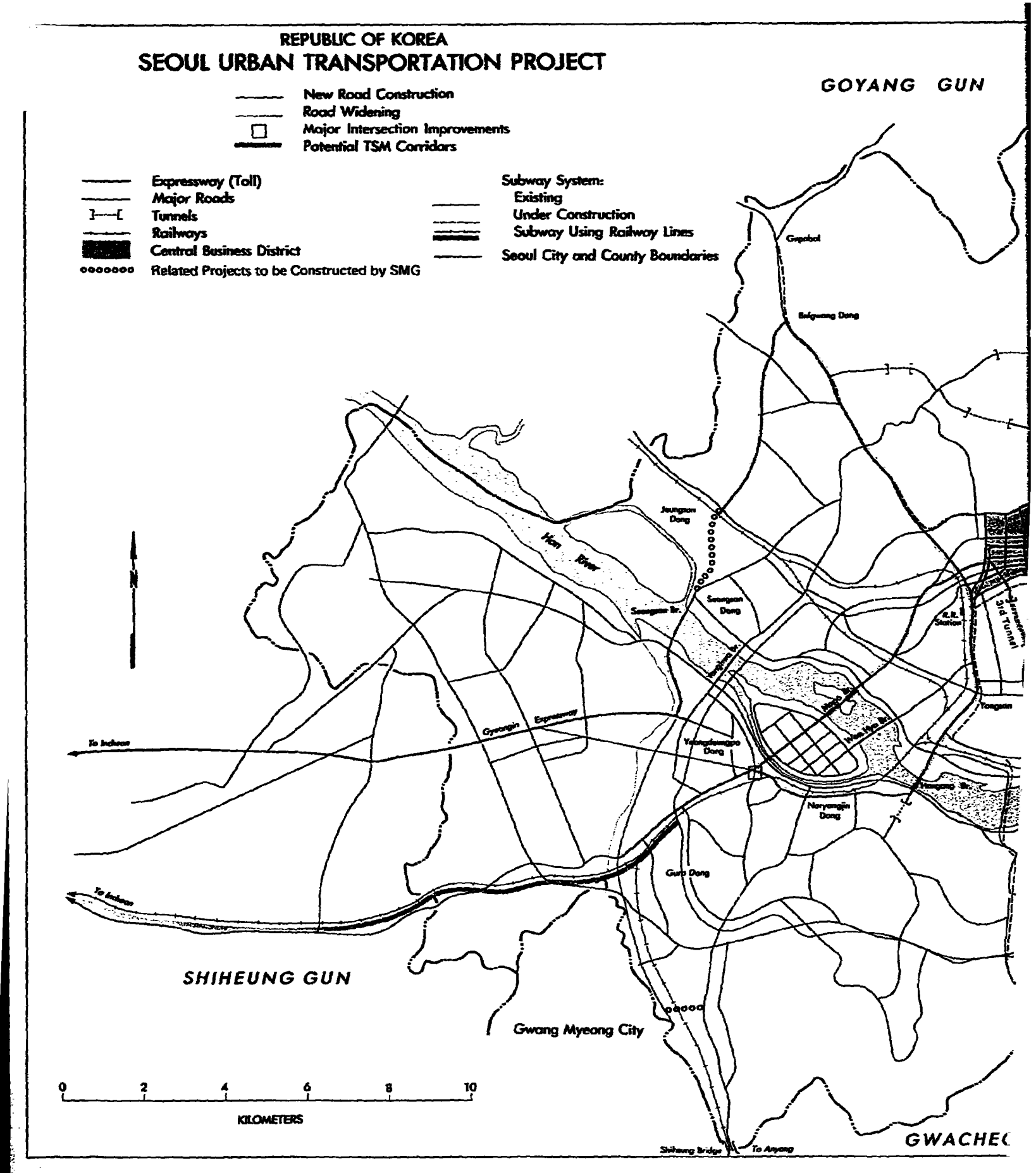
(h) Ministry of Home Affairs. Financial Yearbook of Local Government, 1982-1984.

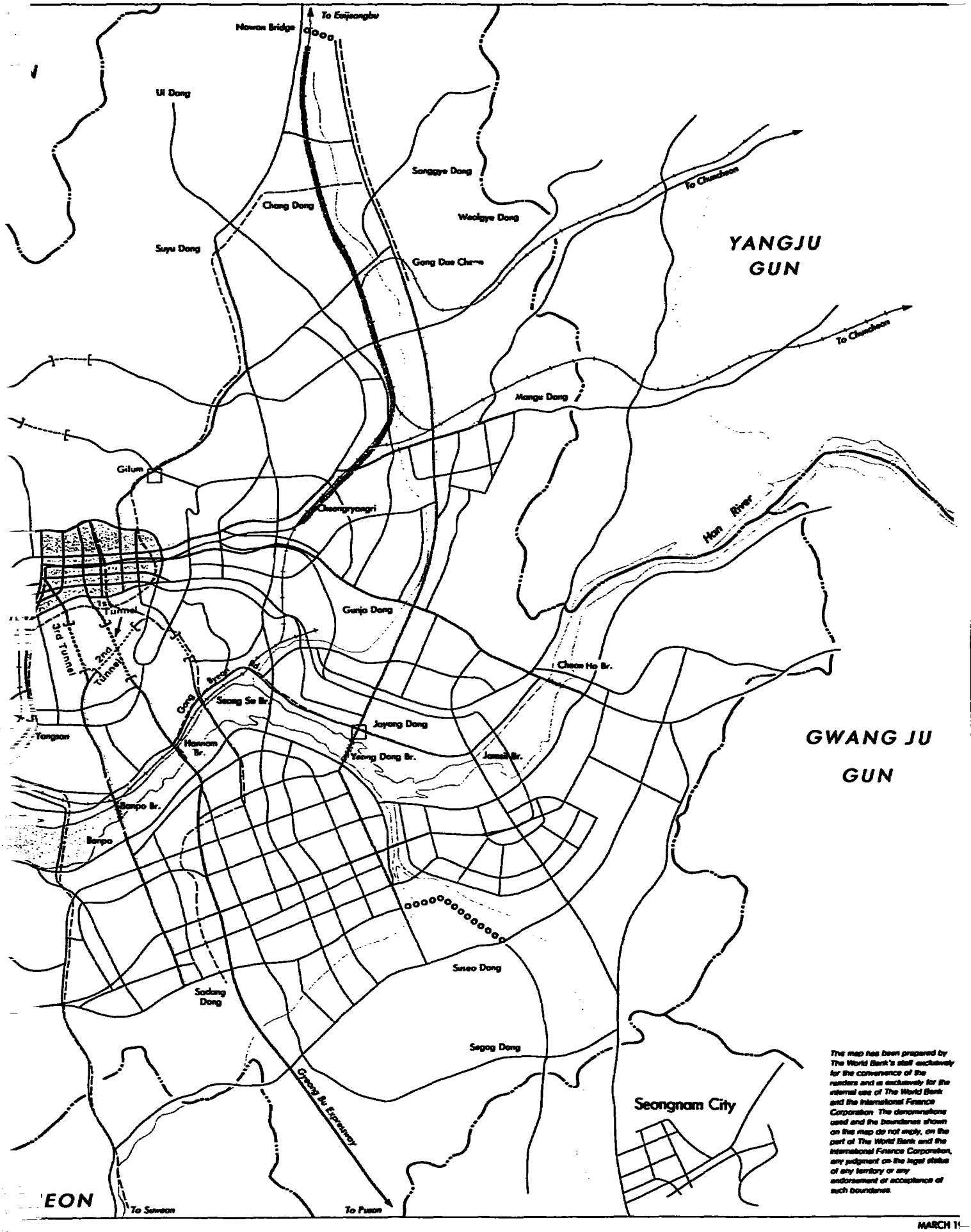
(i) Ministry of Home Affairs. Yearbook of Local Tax Administration, 1983.

(j) Seoul Metropolitan Government. Mid-Term Financial Plan, (1984-1988).

REPUBLIC OF KOREA

SEOUL URBAN TRANSPORTATION PROJECT





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